STATEMENT REGARDING WASHINGTON AVENUE SETTLEMENT CONDITION

Background

In 1909-1912, a deep tunnel was constructed under Washington Avenue from Lucas Avenue to lower Wilbur Avenue. This tunnel was constructed by the City of New York in order to convey combined sewage from Uptown Kingston to the Rondout Creek. The tunnel was constructed due to the fact that the City of New York was impounding the Esopus Creek for water supply purposes and reducing its assimilative capacity downstream. The tunnel has a depth of 80 +/- feet (75 ft at roof, 82 feet at bottom) at the vicinity of the Tannery Brook Crossing, just south of Linderman Avenue. The roof of the tunnel in this area is of "brick arch" construction with timber cribbing above to support the overburden during construction and subsequently left in place (100 years old).

In 1993, contractors working for the city of Kingston installed a storm-water shaft at the Tannery Brook location to divert surface waters into the tunnel. This shaft is 30 inches in diameter and enters through the roof of the Washington Avenue tunnel. Soil borings taken at that time indicated a significant void area above the roof of the tunnel.

The area immediately south of the storm-water shaft has experienced settlement problems over the years and the Department of Public Works (DPW) has repaired the road surface in this location from time to time.

It should be understood that the Washington Avenue Tunnel serves an important sanitary and stormwater conveyance function for much of the City including the entire Washington Avenue corridor and uptown. There currently exist three stormwater shafts; one at Greenkill Avenue (36"), one at Elizabeth Street (24"), and one at the intersection with Tannery Brook. These vertical shaft connections provide a stormwater outlet for runoff that would otherwise cause widespread flooding, property damage and public safety hazards. In addition, the Tunnel carries sanitary sewerage flows from Wards 1, 2, 9 and a portion of Ward 4, depending upon weather conditions, flows total 900,000 GPD to as high as 2,300,000 GPD.

March 2011 Settlement Problems

In March, 2011, the DPW responded to a settlement/sinkhole condition that appeared on the west side of Washington Avenue, immediately south of the storm-water shaft. Several repairs and relocations were made to utilities in the area, and grouting was performed around the storm-water shaft in an attempt to seal leakage of groundwater along the outside wall of the shaft at a rock layer 62 feet below the street surface. The groundwater was carrying fine, silty soil into the tunnel and causing settlement at the street level. The leaking area that was identified by remote TV inspection was sealed as a result of the grouting operation.

Other work performed in 2011 included: the installation of steel sheeting to protect public utilities on the east side of Washington Avenue, pavement and curb restoration, shallow grouting to support a storm-water box culvert structure, and a soil boring to collect data for further analysis and monitoring of the situation.

The street was fully reopened in this area on or about September 1, 2011.

The city of Kingston has monitored surface elevations and settlements continually since July 11, 2011. The results of this monitoring showed very little settlement from July 2011 through March, 2012, a period of 8 months which included Hurricane Irene.

Spring 2012 Settlement Problems

On March 31, 2012, dips began to appear in the road pavement in the same general area as the 2011 settlement. The dips were generally in the range of 1 to 5 inches. The DPW responded with asphalt shimming to level the street pavement and placed warning signs on the road.

During the week of April 9-13, 2012, a visual inspection of the storm shaft and tunnel roof was conducted. During this inspection, a new leak of groundwater and soil was observed in the roof area of the tunnel. Flow was remotely observed to be intermittent, but ranging from 1 to 2 gallons per minute when flowing. This leak was coming from the east side of the tunnel in a new location.

On the morning of Sunday, April 15, a sinkhole formed in east side of Washington Avenue, measuring approximately 2-3 feet in diameter and 7 feet in depth. Material from this sinkhole was immediately observed by TV inspection in the floor of the tunnel. Following the formation of the sinkhole and loss of material, the leak into the tunnel appears to have stopped. TV inspections performed on Monday, April 16, showed no leakage or soil material entering the tunnel.

This section of Washington Avenue has been closed as it is not safe for vehicular travel at this time.

Impacts

The loss of ground has resulted in a number of impacts that include the obvious and several others that are more obscure, including:

1. Transportation – Closure of Washington Avenue to thru traffic between Linderman Avenue and State Route 32. All commercial vehicles have been redirected to Clinton Avenue.

2. Utilities – Temporary disruption of domestic water, natural gas, electrical power, and communications have resulted from abandonment or relocation of portions of distribution systems. Water mains have been capped and temporary service lines installed, gas mains have been temporarily abandoned and natural gas service replaced with individual propane tanks, and new power poles have been installed with supported power, telephone and cable rerouted.

3. Public Safety – Sidewalk access has been restricted in the work zone as has been adjacent property.

4. Wastewater Treatment Plant – For the past week high levels of sediment have entered the

sanitary conveyance system within the Tunnel which has resulted in operational difficulties. Biological treatment at the plant has not been affected, as plant personnel have been able to sequester and remove the additional sediment load at the front end of the plant.

Activities

April-May

Due to the settlement occurring in April 2012, and the new leak observed in the tunnel roof area, the City decided to perform additional testing and inspections. This included:

1. Manned inspection of the Washington Avenue Tunnel in the vicinity of the storm shaft to better observe and photograph the leakage area, and to assess the structural integrity of the tunnel roof.

2. Additional soil borings and soil tests were taken to determine means and methods of permanently stabilizing the road in the area of the storm shaft. Cone penetration testing was utilized to gather important information on soil bearing capacity, soil stratification and pore water pressure.

June-July

Work on the Washington Avenue Tunnel and sinkhole problems continued in full force with the following:

3. Five additional cone test probes were installed around the sinkhole area to better define the soil and groundwater conditions and the top of rock elevation.

4. Tunnel repair technologies were evaluated. "Link Pipe" liner panels were selected to repair the Washington Avenue Tunnel. 160 feet of liner panels were ordered for delivery in early August to repair the brick-arch tunnel near the Tannery Brook Shaft. A purchase order for the Link-Pipe materials was issued by the City Purchasing Department on June 27, 2012 (P.O. No. 18170).

5. Bid documents were prepared in early July and the City advertised for bids to install the Washington Avenue Tunnel repair liners on July 12. Bids were received on August 1 and are currently under review, an award is expected by the end of the week.

6. The existing utilities were removed or relocated in the Washington Avenue sinkhole area. This included the water mains (16" and 6"), the gas mains and the overhead electric lines. The concrete box culvert around the Tannery Brook Shaft was removed. A 24 inch diameter steel pipe was installed to bypass the Tannery Brook around the sinkhole area.

7. Attempts were made to inspect more of the Washington Avenue Tunnel with remote, mobile video inspection equipment. The equipment was unable to move through the tunnel because of soft sediments on the floor of the tunnel.

In summary, the City of Kingston has / is taking all necessary steps to ensure the safety of the public and the protection of property. This undertaking requires the cooperation of the whole community, and we ask that you extend your cooperation throughout our operations this summer and into the fall.